Portfolio Management in a Dynamic Market Environment: A Study of Adaptive Market Hypothesis in the Indian Stock Market

Synopsis for the award of Ph.D. Degree in Business Administration

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Submitted By

DIANA SALDANHA

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Under the Guidance of

Dr. T. MALLIKARJUNAPPA MBA, ACMA, PhD

Professor (Retired)

Department of Business Administration

Mangalore University, Mangalagangotri-574199

Mangalore, Karnataka, India

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1. INTRODUCTION

Stock markets have grown to be one of the promising investment avenues which are characterized with a significant amount of risk. Unlike a physical science experiment where it is possible to add controls and observe a process in isolation, the stock market behaves like a living breathing entity where it becomes nearly impossible to explain exactly what is going on. The changes in the market environment only adds to the complexity of these dynamics.

2. MOTIVATION FOR THE STUDY

The Adaptive Market Hypothesis (AMH) states that the markets are bound to be either efficient or inefficient depending upon the environment in which they operate (Lo, 2004, 2005). By doing so AMH acknowledges that it is impossible to study the stock market in isolation and should be approached from a biological stand point. The AMH heavily draws from the theory of evolution and shifts our focus on the role played by the environment in determining the level of efficiency.

3. NEED AND IMPORTANCE OF STUDY

The study is important as critics of the AMH have argued that the theory is a philosophical qualitative model due to the lack of standard methodological framework to test its assumptions (Li et al., 2021; Pal, 2016). The comparison between GFC period and Covid-19 period intended in our analysis would offer remarkable insights into market behavior and our understanding of adaptive efficiency which would enable us to answer this duality in the nature of efficiency in the adaptive market hypothesis. We found that there is a dearth of comprehensive studies comparing the adaptive behavior when it comes to market anomalies and price volume relationships along with instances of return predictability. Also it is worthwhile exploring whether the level of market segregation used to test the AMH has any influence on the conclusions drawn regarding the nature of adaptive efficiency. So we need to look for efficiency at aggregate market level, firm level and sector level to understand how it behaves with changing market conditions (Phan et al., 2018).

We feel that these ambiguities and gaps in our understanding of what adaptive markets actually entail are making it difficult to test the market in the real environment. Our study offers necessary insights to fill this disconnect.

4. SYNTHESIS OF THE GAPS IDENTIFIED IN THE LITERATURE REVIEW PROCESS

Firstly we find there is scope for developing a theoretical framework to ascertain the testable implications of AMH, we set out to fulfil this gap by our research. Secondly, the question; "does the market evolve over time?", still remains largely unanswered by the research so far conducted. Thirdly, we find that studies testing the AMH for the sector level and firm level not been conducted yet. As suggested by Phan et al., 2018, efficiency dynamics differ sector wise and therefore should not be ignored. The fourth notable observation is that we do not find any comprehensive studies testing for AMH which compares the market response to such events, we feel this gap should be addressed (Saldanha et al., 2023).The fifth gap was pertaining to the nature of TOM effect in the Indian stock market; we explore whether its behaviour is in line with AMH or behavioral finance when it comes to the Indian stock markets as there is dearth of research in this area (Chandra, 2009; Tadepalli & Jain, 2022). The sixth gap pertains to the limited research in the area of Price-Volume (P-V relationships particularly in the Indian market. We seek to fill this gap by studying these dynamics and their time varying nature for an extended time period at the aggregate market level, sector level and firm level.

5. RESEARCH QUESTIONS

5.1. Is the stock market showing adaptive behaviour in terms of return predictability?

5.2. Is the stock market showing adaptive behaviour in terms of the market anomaly of TOM effect?

5.3. Is the stock market showing adaptive behaviour in terms of price – volume relationships?

5.4. Does the nature of adaptive efficiency vary at aggregate market level, sector level and firm level?

5.5. Does the market shift between efficiency and inefficiency indefinitely or show resilience and evolution with time?

6. PROBLEM STATEMENT

The determinants of adaptive behavior in the emerging stock market of India must be identified and analyzed for time varying efficiency to facilitate construction of resilient investment portfolios of equities.

7. OBJECTIVES OF THE STUDY

7.1 To study the return predictability in the Indian stock market at the aggregate market level, sector level and firm level.

7.2 To study the persistence of TOM effect in the Indian stock market at the aggregate market level, sector level and firm level.

7.3 To study the dynamics between stock returns and trading volume in the Indian stock market at the aggregate market level, sector level and firm level.

7.4 To study the whether there is evolution in the market efficiency dynamics of the Indian stock market

7.5 To suggest the portfolio management strategies that would fare better in a dynamic environment

8. HYPOTHESES OF THE STUDY

$H_0$1: There is no return predictability in the data

$H_0$2: There is no structural change in the data

$H_0$3a: Price does not granger cause volume

$H_0$3b: Volume does not granger cause price

9. DATA

The secondary data related to the closing prices and the trading volumes are used in the analysis. The data was collected from the PROWESS database maintained by the Centre for Monitoring of Indian Economy (CMIE) as well as the historical archives of the official website of the National Stock Exchange of India (NSE). The Nifty 50 index is used as a benchmark for analysis at the aggregate market level. The sector indices namely, Nifty Bank and Nifty IT and the thematic index Nifty Infra are used to capture the nature of these relationship for the banking sector, IT sector and

the infrastructure sector. 37 companies which are listed on the NSE and are constituents of the Nifty 50 index are chosen for the study. Some of these companies are also the constituents of Nifty Bank, Nifty IT and Nifty Infra indices. We have selected only those indices and companies for which price-volume relationship data is available for the entire sample period of 4th April 2005 to 5th July 2022. Out of these companies 18 have been part of the index for the whole sample period 16 have not been part of the index during the entire sample period and 3 companies are no longer part of the Nifty 50 Index. Daily closing prices and volume data are collected from 4th April 2005 to 5th July 2022. To study the return predictability, the daily observations of closing prices were converted into weekly data. The weekly closing prices have been converted into weekly log returns. To study the market anomaly, the daily closing prices have been converted into daily log returns. To study the P-V relationships, the daily closing prices have been converted into daily log returns and the daily trading volume is arrived at by using the natural logarithm of number of shares traded as is the common practice in financial literature (Samman & Al-Jafari, 2015) .

10. SUMMARY OF RESULTS

We tested for evidence of adaptive market hypothesis in 4 indices and 34 companies listed in the National Stock Exchange of India from 6th April 2005 to 22nd June 2022 using the Generalized Spectral test of Escanciano and Velasco (2006) under a rolling window of fixed 1-year window length. The return predictability was highest with the changes in the financial environment like a global crisis or policy changes. We find that there is heterogeneity sector-wise and firm-wise as far as response to a particular scenario is concerned. The co-movement between the benchmark indexes with its constituents is highest during time of crisis. During relatively stable periods even though we record no return predictability at aggregate market level, at sector level and firm level there is ample evidence of significant return predictability.

We tested for the TOM effect using the Lakonishok & Smidt (1988) methodology for the daily stock returns from 4th April 2005 to 5th July 2022 under the influence of Bai & Perron (1998) multiple structural break test. As far as the time varying nature of the TOM effect is concerned our study is in agreement with the previous research findings particularly those studies which link this behaviour to the theory of adaptive market hypothesis (Obalade & Muzindutsi, 2019; Patil & Rastogi, 2019; Singh et al., 2021; Urquhart & McGroarty, 2014). The Indian market appears to be

efficient for the most part however there are instances where it is inefficient for a sufficient length of time for traders to profit from trading strategies.

When we tested for causal dynamics between price and volume using Granger (1969) causality tests we find that for most of the observations, there were no causal relationships between price and volume both with and without the influence of structural breaks. However, there were instances of sufficiently lengthy periods of unidirectional and bidirectional causality making it possible for trading strategists to beat the market. Moreover such causal relationships appeared to be varying with time with respect to direction. In other words, unidirectional causality from stock returns to trading volume in one regime may reverse direction in the other, totally disappear in the consequent regimes but re appear at a later date. This behavior was consistent in companies that displayed such behavior for the entire sample period. Therefore, gradual evolution towards efficient behavior was not found.

11. CONCLUSION

We find that with respect to the factors of return predictability, TOM effect and P-V relationships considered and analysed simultaneously using a combination of methodologies such as the Generalized Spectral test, time varying dummy variable regressions and granger causality tests under structural breaks; the market appears to have evolved towards efficiency in the long run. Our findings are in general agreement with the work of Hiremath & Kumari (2014) for the Indian stock markets who suggested that Indian market seems to be moving towards efficiency. The overall market ecosystem reveals that the periods of inefficiencies linger and follow a specific pattern which makes it possible for trading strategies to succeed during specific time periods such as financial crisis, policy changes and other related factors. This behavior demands for strategies that are able to reconcile active and passive portfolio management styles. We feel the importance of using technology to expedite the process of portfolio management for equity investments to incorporate the dynamic shifts in the market environments.

12. CHAPTER SCHEME

The present study is presented in 9 chapters

Chapter 1 – INTRODUCTION: It covers Background for the Study, Impact of events such as Global Financial Crisis, Demonetization of the Indian rupee, Goods and Services Tax, Covid-19

Pandemic on the stock market, Motivation for the Study, Conceptual Overview, Need and Importance of Study, The Stock Market Constituents Considered For the Study, Theoretical Constructs of Adaptive Market Efficiency, Return Predictability and Market Efficiency, Market Efficiency and Market Anomaly of the Turn of the Month Effect, Market Efficiency Observed With Respect To Dynamics between Stock Price and Trading Volumes, Market Efficiency and Implications for Portfolio Management, Scope and Delimitations of the Study

Chapter 2 – LITERATURE REVIEW: It covers the Systematic Review Process, Bibliometric Analysis, Narrative Review Process, Synthesis of the Gaps Identified in the Literature Review Process and Formulation of Research Questions

Chapter 3 – RESEARCH METHODOLOGY: It covers the Problem Statement, Objectives of the Study, Hypotheses of the Study, Data, Data Collection and Classification, Type of the Data Used and Sample Period, Econometric Models used in the Study, Limitations of the Study

Chapter 4 – RETURN PREDICTABILITY UNDER VARYING MARKET CONDITIONS: It covers the aspects such as Return Predictability and its Implications, Market Conditions during 2005-2022, Implication of heteroskedasticity in Stock Returns, Empirical Analysis and Discussion, Time Series Plot of Returns, Results of the Generalized Spectral Test

Chapter 5 – THE ECONOMIC PHENOMENON OF THE TURN OF THE MONTH EFFECT: It covers concepts such as Pay Day Hypothesis, Portfolio Rebalancing Hypothesis, Tracking the TOM Effect with the help of a Dummy, Subsample Analysis, and Issues Related to Choice of the Subsample, Structural Breaks and their Role in Selection of Subsamples, Empirical Analysis and Discussion

Chapter 6 –DYNAMICS BETWEEN STOCK PRICE AND TRADING VOLUME UNDER VARYING MARKET CONDITIONS: It covers the Implications of relationships between price and volume, Empirical analysis and discussion, Descriptive statistics of the return series, Descriptive statistics of the volume series, Results of the granger causality tests, Variation in the nature and type of causality, Cyclical market efficiency, Predominance of EMH at aggregate market level

Chapter 7 – MARKET ENVIRONMENT ASSOCIATED WITH THE RESULTS: It elucidates the sector allotment of firms in the sample and Market environment associated with structural break tests with a sectorwise perspective.

Chapter 8 – SYNTHESIS OF ADAPTIVE BEHAVIOR IN STOCK MARKET DYNAMICS: This chapter synthesizes the adaptive behavior sector wise, market index wise and year wise and prescribes the Portfolio management strategies to be used in a dynamic environment exhibiting adaptive efficiency

Chapter 9 – CONCLUSION: It includes the Summary of the results, Implications of the study and Scope for future research

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12. Saldanha, D., Mallikarjunappa, T., & Oware, K. M. (2023). Determinants of Adaptive Behaviour in Stock Market: A Review. *Vision*, 09722629221148809.
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DETAILS OF WORKSHOPS AND FDPS ATTENDED

1. Five days Global Initiative for Academic Networks (GIAN) course on "Digital Payments: Technology for Cashless Society" conducted in the Department of Studies and Research in Computer Science, Mangalore University during 23rd to 27th July 2018.

2. One day Research Methodology Workshop organized by the Department of Business Administration, Mangalore University on 30th July 2018

3. Two days National Level Conference on Corporate Social Responsibility (CSR): Challenges and New Initiatives held at Department of Studies in Commerce, Mangalore University on 14th and 15th September 2018.

4. Seven days Global Initiative for Academic Networks (GIAN) on "Global Sourcing Strategies and Applications", organized by Department of Post Graduate Studies and Research in Commerce, Mangalore University, Mangalagangotri, 11th February to 16th February 2019

5. One day Workshop on "Development of Faculty Profile and Institutional Distinctiveness" held on 9th of March 2019 in Sri Poornaprajna Evening College, Udupi.

6. Four days Workshop on "Advanced Econometrics for Research in Social Sciences Using R" organized by the School of Management Studies, University of Hyderabad, 29th March to 1st April 2019.

7. Seven days Global Initiative for Academic Networks (GIAN) on "Contemporary Finance Tools", organized by the Department of Business Administration, Mangalore University, from 10th to 17th June 2019.

8. One day workshop on Bibliometrics and conducting Literature Review using scientific and open source tools organized by Department of Commerce, University College, Hampanakatta, Mangalore on 28th July 2019

9. EUREKA -19 a three days International workshop on Research, writing and publishing in reputed journals organized by the Department of Mechanical Engineering, PA College of Engineering, Mangalore on 7th,8th and 9th August 2019.

10. International Webinar on "Meet the Journal Editors-A Digital Interaction" hosted by College of Banking and Financial Studies in association with Oman Economic Association on 29th July 2020.

11. Webinar on the topic "Open Source Tools for Data Analysis in Social Sciences" hosted by the Department of Commerce, Manipal Academy of Higher Education, Manipal on 31st July 2020.

12. International Webinar on "Investment Strategies- A Global Perspective" hosted by Poornaprajna College and Postgraduate Centre Udupi on 8th August 2020.

13. Two day workshop on "Application of Mendeley in Research" hosted by Institute of Policy Research in Economics, Management and Social Development (IPREMS), Berhampur, Odisha on 30th and 31st August 2020.

14. Five days online International Research Development Program on Conceptual Research Model and Analysis using Structural Equation Modelling hosted by Sri Ramakrishna Institute of Technology, Coimbatore from 7th to 11th September 2020.

15. Five days workshop on Data Analysis using Econometric modeling and R software hosted by Institute of Policy Research in Economics, Management and Social Development (IPREMS), Berhampur, Odisha from 26th to 30th December 2020

16. One Week Online National Research Methodology Workshop organized by Sri Vaishnav School of Management, Indore held from 18th -23rd January, 2021.

17. International Webinar titled "Stock Market Volatility during Covid 19 Pandemic and its Economic Implications" organized by Kalinga Institute of Industrial Technology (KIIT), Deemed to be University, Bhubaneshwar, Odisha on 5th February 2021.

18. Webinar titled "How to write Effective Manuscript to a Scopus Indexed Journal (in domain of Social Science Research) organized by Department of Business Administration, St Aloysius College (Autonomous), Mangaluru on 4th June 2021.

19. National Webinar on "Data Analysis Using Jamovi" organized by Post Graduate Department of Commerce, Government College, Kattappana, Idukki District, Kerala on 6th August 2021.

20. National One Week Faculty Development Program (FDP) in "Research Excellence and Academic Development (READ-2021)" organized by Department of Library and IQAC, Nilkanthrao Shinde Science and Arts College, Bhadrawati District, Chandrapur, Maharashtra on 9th to 14th August 2021.

21. International Webinar on "Corporate Ethics and Sustainable growth- A Post Pandemic Perspective" jointly organized by the Department of Commerce, Commerce Association and Consumer Club, University College, Mangalore on 31st August 2021.
22. National Level Webinar on "Entrepreneurial Marketing Dimension" organized by the Department of Post Graduate Studies in Commerce and Besant Institution Innovation Council in association with IQAC on 7th September 2021.

23. Online National Workshop-2021 on "Corporate Governance and Financial Management" organized by the Department of Studies in Commerce, Mangalore University, Mangalagangothri, Karnataka on 10-12th September 2021.
24. National e-Symposium on "National Education Policy 2020 and Innovation in Academics" organized by Policy Research in Economics, Management and Social Development (IPREMS), Berhampur, Odisha on 31st October 2021.
25. Two-days online workshop on "Bibliometrics, Synthesis and Review", organized by IQAC and the Department of Commerce, KTM College of Advanced Studies, Karuvarakundu, Kerala on 14-15th November, 2021.
26. National Webinar on "Using Mendeley for Systematic Review", organized by IQAC of St. Mary's College, Sulthan Bathery, Kerala on 27th November, 2021
27. National Seminar on "Ethics & Values in the Contemporary Society" conducted by the Department of Management Studies, Central University of Kerala on 10th February 2022.
28. Three-days online workshop on Pedagogical Innovations and Student Outcome organized by KTM College of Advanced Studies, Malappuram, Kerala on 27th to 29th May 2022.

DETAILS OF SEMINARS DELIVERED /PAPERS PRESENTED IN NATIONAL AND INTERNATIONAL CONFERENCES

1. Saldanha, D., & Mallikarjunappa, T. (2019). "**A Review of Exchange Traded Funds in India**", at two days International Conference on "Contemporary Innovations in Industry and Commerce, organized by Department of Post Graduate Studies and Research in Commerce, Mangalore University, Mangalagangotri, 22rd February to 23rd February 2019

2. Saldanha, D., & Mallikarjunappa, T. (2019). "**Market Efficiency and Behaviour of Capital Markets**", at the 5th International Conference on "A Decade of Global Financial Crises: Antecedents, Aftermath and Challenges Ahead" held at St Aloysius Institute of Management and Information Technology (AIMIT), Beeri, on 9th April 2019

3. Saldanha, D., & Mallikarjunappa, T. (2019). "**Corporate tax cut announcement and its impact on the Indian Automobile Sector**", at one day National Conference on Emerging

Trends in Business and Management organized by Department of Business Administration, Mangalore University, Mangalagangotri, on the 30th of December, 2019

4. Saldanha, D. (2020). "**Research methodology-Literature review and Bibliography**" in Poornaprajna College Udupi for the students of M.Com as part of the guest lecture held on 10th January 2020.

5. Saldanha, D., & Mallikarjunappa, T. (2020). "**The impact of the cut down of India's growth estimate by the IMF on the Banking Sector- A Study on the Nifty 50 and Nifty Bank Index**", at the one day National Conference on Contemporary Issues in Commerce and Management held at Dr. G. Shankar Government Women's First Grade College and PG Study Centre, Ajjarkadu, Udupi on 31st January 2020

6. Saldanha, D., & Mallikarjunappa, T. (2020). "**Test for weak form of EMH: A Study on the broad market and sectoral indices of the National Stock Exchange of India**", at the two day National Conference on Emerging Business Trends (EBT)-2020 organized by Department of Studies in Commerce, Mangalore University, Mangalagangotri, 4th and 5th March 2020.

7. Saldanha, D., & Mallikarjunappa, T. (2020). "**Evidence for Adaptive Market Hypothesis in the Indian Stock Market**", at the one day National level e-Conference on Economy in COVID-19 and Beyond organized by the Centre for Management Studies and Research, P.A College of Engineering, Mangalore on 8th October 2020.

8. Saldanha, D., & Mallikarjunappa, T. (2021). "**Impact of US Commodity futures on the returns of Nifty 50**" in National Conference on Paradigm Shift in Indian Economy: A Way Forward organized by Institute for Policy Research in Economics, Management and Social Development (IPREMS), Berhampur, Odisha on 10-11th July 2021.

9. Saldanha, D., & Mallikarjunappa, T. (2021). "**Interdependencies between Forex Rate and Indian Equity Market**" in the International Conference on Commerce, Management and Interdisciplinary Subjects (ICCMIS) organized by the Department of Commerce and International Business, School of Business Studies, Central University of Kerala, held on 28-29th October, 2021.

10. Saldanha, D., & Mallikarjunappa, T. (2021). "**Evolution of Turn of the month effect in the Indian Stock Market**" in National Level Seminar on Evolution of Indian Economy in the Post Independent Era organized by the Department of Business Administration, Mangalore University, Mangalagangothri, Karnataka on 13th August 2022.

DETAILS OF PAPERS PUBLISHED

1. Mallikarjunappa T., Saldanha, D., & Hawaldar, I. T. (2023). The Dynamics of the Relationship between Stock Returns and Trading Volumes: An Emerging Markets Perspective during Varying Market Conditions. *Journal of Open Innovation: Technology, Market, and Complexity*, 100202.
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Diana Saldanha
Research scholar
Dept. of Business Administration
Mangalore University
Mangalagangothri, Mangalore.

Dr. T. Mallikarjunappa
(Research Guide)
Professor (Retired)
Dept. of Business Administration
Mangalore University